

Concentration ratios to crops and garden products near Olkiluoto repository site

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Abstract. In Finland, Olkiluoto Island on the western coast has been selected as a repository site for spent nuclear fuel disposal. With approaching licensing steps, the biosphere assessment demonstrating the long-term safety of the repository is developed into more and more site specific. As the literature data on site-relevant crops and garden products on site-relevant soils are sparse or in some cases lacking for the elements of a high relevance to the biosphere assessment of the Olkiluoto spent fuel repository, crops and garden products were collected from farms nearby the site. The samples were then analysed for stable elements for initial contribution to the site-specific database in respect of these edibles. In the final paper, the soil-to-plant concentration ratios are presented for the edible and also other parts of most common crops and garden products in the region.

1. INTRODUCTION

In Finland, Olkiluoto Island on the western coast has been selected as a repository site for spent nuclear fuel disposal. With approaching licensing steps (application for nuclear construction licence in 2012), the biosphere assessment demonstrating the long-term safety of the repository is developed into more and more site specific. In the case of the Olkiluoto spent nuclear fuel repository, the nuclides contributing most to the doses of the most exposed persons, and of the other public, were in the recent assessment [1] I-129 and Cl-36, with C-14 having a high contribution in some release scenarios. Other elements (corresponding to the released nuclides) of high relevance include Se, Mo, Ni, Nb and Cs. Even though there are relatively much data on the agricultural ecosystem, e.g. the total number of data underlying of the recent IAEA handbook values [2] to soil to plant transfer factors to any crop, site-relevant or not, is as low as none for I, 6-14 for Cl, none for Se, 1-3 for Mo, 27-44 for Ni, and 1-2 for Nb, the range depending on the crop type. Even for the well-studied Cs the respective number of data is not higher than 4-470, in principle covering the variability of conditions within temperate climate domain (normally excluding the boreal zone where the Olkiluoto repository site is located). The number of data divided to combinations of crop types and soil types would be even less, and contribution from soil-to-fruit data in the case some elements does not help much; it is evident that also for crops a site-specific database is needed not only to ensure the appropriateness of the literature data but to fill data gaps - work that should have been initiated long ago but was not that apparent before entering to the real site-specific stage along the near onset of construction of the repository.

To initialise the collection of the site-specific data on soil-to-crop transfer, and other parameters relevant in the radionuclide transfer and dose assessments, common crops and garden products were sampled from two farms nearby the repository site in the autumn of 2010. The farms were selected on the basis of familiarity and experience of good co-operation, and the different crops were then chosen based on the availability at the farm.

2. MATERIAL AND METHODS

The farms where the crops and garden products were sampled both locate close to the Olkiluoto repository site in the municipality of Eurajoki, southwestern Finland. Barley, carrot and zucchini were sampled in 1 September 2010 (zucchini already in 2008) from a farm 15 km southeast of the Olkiluoto site. From a small commercial garden, 6 km southeast from Olkiluoto, lettuce and berries of red and black currant were sampled in 17 August 2010.

3. RESULTS AND DISCUSSION

Results of the laboratory analyses for the most relevant elements to the biosphere assessment of the Olkiluoto spent nuclear fuel repository (see section 1), and the calculated soil-to-plant concentration ratios will be presented in the full paper due to time schedule issues.

References

- [1] T. Hjerpe, A.T.K. Ikonen, R. Broed, Biosphere assessment report 2009, POSIVA-2010-03 (Posiva Oy).
- [2] IAEA, Technical Report Series 472 (International Atomic Energy Agency, 2010).